Complete Summary

GUIDELINE TITLE

Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI).

BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2006 Apr 28 [various].

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2005 Sep 25 [Various]

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Acute ST elevation myocardial infarction (STEMI)

GUIDELINE CATEGORY

Evaluation
Management
Treatment

CLINICAL SPECIALTY

Cardiology
Emergency Medicine
Internal Medicine

INTENDED USERS

Health Care Providers
Physicians

GUIDELINE OBJECTIVE(S)

Evidence-Based Medicine Guidelines collect, summarize, and update the core clinical knowledge essential in general practice. The guidelines also describe the scientific evidence underlying the given recommendations.

TARGET POPULATION

Patients with acute ST elevation myocardial infarction (STEMI)

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation/Management/Treatment

Procedure Prior to Treatment

1. Evaluate appropriateness of administering thrombolytic therapy (clinical picture, pain, electrocardiogram [ECG] results, no contraindications)
2. Continuous ECG monitoring
3. Glyceryl trinitrate and oxygen
4. Aspirin
5. Intravenous cannulas with sodium chloride (NaCl) infusion
6. Blood samples (haemoglobin, leucocytes, sodium, potassium, creatinine, creatinine kinase, creatinine kinase-MB, or troponin)
7. Beta-blocker
8. Nitrate infusion if indicated

Thrombolytic Treatment

1. Thrombolysis with streptokinase or a tissue plasminogen activator (tPA) (tenecteplase, reteplase, or alteplase)
2. Heparin with tPA thrombolysis

Other Management/Treatments

1. Transfer to hospital
2. Treatment of complications
3. Assessment of coronary artery patency
4. Percutaneous transluminal coronary angioplasty (PTCA)

MAJOR OUTCOMES CONSIDERED

- Rates of acute ST-segment elevation myocardial infarction
- Treatment outcomes
    - Coronary artery patency
    - Re-occlusion rates
    - 30-day prognosis
    - Mortality rates
    - Complication rates

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The evidence reviewed was collected from the Cochrane database of systematic reviews and the Database of Abstracts of Reviews of Effectiveness (DARE). In addition, the Cochrane Library and medical journals were searched specifically for original publications.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

A. Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
B. Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
C. Limited research-based evidence. At least one adequate scientific study.
D. No research-based evidence. Expert panel evaluation of other information.

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The levels of evidence [A-D] supporting the recommendations are defined at the end of the "Major Recommendations" field.

Basic Rules

- The earlier the thrombolytic therapy is started, the better the chances of achieving reperfusion. Time is more crucial than the agent used. "One hundred minutes from the onset of pain" (Boersma et al., 1996) [A].
- All patients fulfilling the criteria should be offered treatment. Delays must be prevented at all treatment phases. Treating an imminent major acute myocardial infarction (MI) with thrombolytic therapy is as urgent as the treatment of multiple trauma!
- Pharmacological reperfusion therapy consists of the administration of a fibrinolytic and antithrombotic agent.
- If pharmacological reperfusion therapy is contraindicated, or has failed, an attempt should be made to recanalize the artery with balloon angioplasty

- Electrocardiogram (ECG) recordings of acute ischaemic chest pain must be repeated if the first one is non-diagnostic.

Indications

- All the criteria 1 to 4 must be met.
    1. Clinical picture of imminent MI (note that the main symptom instead of pain is sometimes dyspnoea and acute left ventricular failure).
    2. Pain lasting more than 20 minutes but less than 6 hours. Treatment might be indicated even if the symptoms have lasted for longer, especially if the pain and ST segment elevation persist. Treatment outcome worsens sharply when treatment delay exceeds four hours, and thrombolytic treatment administered 12 hours after the onset of pain is rarely of any benefit.
    3. ECG shows new signs of imminent myocardial damage:
        - ≥2 mm ST segment elevation at the J point in at least two chest leads or
        - ≥1 mm ST segment elevation in at least two limb leads or
        - New left bundle branch block (that prevents the evaluation of ECG) or
        - Reciprocal ST segment depression (V1-V3,4) due to posterior wall damage

    4. No contraindications

- If previous ECGs are available, check that the changes are new. Most interpretation errors occur with early repolarisation (ST segment elevations in chest leads V1-V4) and myocarditis (See Finnish Medical Society Duodecim guideline "Myocarditis.").
- A small Q wave does not prevent thrombolysis, although it indicates that myocardial damage has already occurred.
- Thrombolytic therapy is particularly important for patients with high ST segment elevations in chest leads and no deep Q waves. If recanalization is not achieved with pharmacological reperfusion therapy, these patients warrant rescue angioplasty.

Possible Indications

- There is no consensus on whether a true posterior wall infarction manifesting with reciprocal ST segment depression (V1-V3, 4) should be treated with thrombolysis, because anterior ischaemia may cause similar changes. If the clinical picture is suggestive of an acute MI, thrombolysis may be considered. It is acceptable not to attempt reperfusion in a small inferior MI, particularly if the patient is at risk of bleeding. This should be considered especially in cases where the ST segment changes reverse quickly after the administration of nitrates, aspirin, and beta-blockers. A posterior infarction is often associated with a more extensive inferior-posterior infarction with accompanying inferior ST segment elevation (II, III, aVF) and/or ST segment elevation in V4R suggestive of right ventricular involvement. If a posterior infarction is associated with a lateral infarction, ST segment elevation will be seen in the lateral leads (aVL, I, V6).

- If the ECG is distorted by a bundle branch block or paced rhythm, the need for thrombolysis must be based on the clinical picture.
- Thrombolysis is of no benefit in a non-Q wave infarction (ST depression + increased serum markers) or in unstable angina, where the pain is caused by a partially occluded artery blocked by a platelet-rich clot originating from a plaque rupture. Medication to inhibit platelet aggregation is recommended for these patients (aspirin, clopidogrel, glycoprotein [GP] IIb/IIIa inhibitors) (See the Finnish Medical Society Duodecim guideline "Unstable Angina Pectoris.").
- T-wave inversion, in a patient with a diseased left anterior descending artery (LAD), is usually indicative of a recanalized coronary artery. Due to the risk of reocclusion, angiography should be carried out during the same admission.

Contraindications

- If fibrinolytic therapy is contraindicated or has failed (Van de Werf et al., 2003), the patient must be referred urgently to a hospital where the occluded artery can be opened with angioplasty.

Absolute Contraindications

- Strong suspicion of dissection of the aorta
- Pericardial effusion
- Active gastrointestinal or other internal bleeding
- Brain tumour, arteriovenous malformation, or aneurysm
- Ischaemic stroke in preceding 6 months (a verified transient ischemic attack [TIA] is an exception)
- Previous intracerebral haemorrhage or subarachnoid haemorrhage
- Intracranial procedure or recent head trauma
- Severe known bleeding disorder: coagulation abnormality, thrombocytopenia, etc.

Relative Contraindications

- Fibrinolytic treatment should be considered even if the patient has relative contraindications if the onset of pain is within three hours, a large (anterior) infarction is imminent, and no deep Q-waves have developed yet. The relative contraindications are:
    - Recent intestinal bleeding, for example an ulcer
    - Recent surgery or significant trauma within preceding 2 to 4 weeks
        - At least 4 weeks safety period after, e.g., brain or eye surgery
    - Hypertension (i.e. systolic over 180 to 200, diastolic over 100 to 110 mmHg)
    - Other life-threatening illness, for example, hepatic cirrhosis, renal insufficiency, etc.
    - Anticoagulant therapy increases the risk of intracerebral haemorrhage. If the patient is at risk of bleeding, vitamin K should be administered.
        - Patients on anticoagulant therapy require extra vigilance when possible fibrinolytic therapy is considered (balloon angioplasty is the primary choice). Administration of vitamin K is too late when a massive bleeding has already occurred.

- Other factors increasing the risk of bleeding should also be taken into account (e.g., anaemia, thrombocytopenia, known haemophilia [also von Willebrand], advanced age, septic illness, cancer).

Procedures Before Treatment

1. Continuous ECG monitoring, readiness to defibrillate
2. Administer glyceryl trinitrate—two sublingual tablets or two doses of a spray—and oxygen: observe ST segment changes. (If the changes are reversible, reconsider the need for the thrombolytic treatment.)
3. Aspirin 250 milligrams orally (not if the patient is on warfarin or allergic to aspirin)
4. Insert two intravenous (i.v.) cannulas and start an infusion of NaCl (0.45% or 0.9%).
5. Take the following blood samples (preferably from the i.v. cannula before connecting the infusion): haemoglobin, leucocytes, sodium (Na), potassium (K), creatinine, creatinine kinase (CK), CK-MB or other serum marker of myocardial necrosis. (Do not wait for the results.)
6. Beta-blocker (atenolol, metoprolol) may be given 5 mg i.v. over 5 minutes; repeat after 10 minutes if heart rate is over 50-60 beats/minute and there are no other contraindications (severe heart failure, asthma).
7. If blood pressure is high (>160/100), it should be reduced with a nitrate infusion.

Carrying Out Thrombolytic Treatment

- Thrombolysis is usually carried out using tissue plasminogen activator (tPA) (tenecteplase, reteplase, or alteplase), but streptokinase may also be used (not recommended for elderly patients). The price difference is considerable but the effect on mortality is small. Streptokinase therapy is more difficult to carry out as it requires vigorous monitoring of blood pressure and continuous infusion. Heparin is not used together with streptokinase, but with tPA it is mandatory.
- Every effort must be made to minimize treatment delays whilst taking the contraindications into consideration.

Special Indications for Streptokinase Administration

- Increased risk of intracerebral haemorrhage (age over 75 years, high blood pressure, previous cerebral infarction) and
- A small infarction

Special Indications for tPA Administration

- Streptokinase allergy
- Previous streptokinase treatment (5 days to 2 years)
- Hypotension
- Large anterior wall damage (Granger et al., 1994; Barbagelata et al., 1997) [A]
- New thrombus after streptokinase therapy (in 10 to 15% of patients, usually within a few hours to days after thrombolysis)

Reteplase Regimen

- Give two bolus injections (10 + 10 U) of reteplase (Rapilysin®) at a 30-minute interval.
- Heparinization (DARE-988072, 1999; Antman et al., 2002) [B] (e.g., enoxaparin [Klexane®] 30 mg bolus intravenously at the beginning of thrombolysis, 1 mg/kg subcutaneously at the end of thrombolysis, and 1 mg/kg twice a day [b.d.] subcutaneously during the next 3 days). For a patient over 75 years of age, no intravenous bolus is given and the dose of subcutaneous enoxaparin is 0.75 mg/kg b.d. Any warfarin treatment should be discontinued.

Tenecteplase Regimen

- Give tenecteplase (Metalyse®) according to body weight (Table below; maximum dose is 10,000 units = 50 mg)
- Give as a single bolus over 10 seconds.
- Heparinization as described above

Table. Administration of Tenecteplase

Patient's weight (kg)	Tenecteplase (U)	Tenecteplase (mg)	Amount of reconstituted solution (mL)
<60	6,000	30	6
60-69	7,000	35	7
70-79	8,000	40	8
80-89	9,000	45	9
90-	10,000	50	10

Alteplase Regimen

1. Dilute the two 50 mg bottles of alteplase (Actilyse®).
2. Using a syringe, give 15 mL (15 mg) by intravenous injection over 1 to 2 minutes.
3. This is followed by intravenous infusion of:
    - 0.75 mg/kg over the next 30 minutes (maximum 50 mg = 50 mL) and then
    - 0.5 mg/kg over the next 60 minutes (maximum 35 mg) (Granger et al., 1994; Barbagelata et al., 1997) [A]
    - The total duration of the treatment is 90 minutes. An infusion pump must be used for the administration.
    - Heparinization (DARE-988072, 1999; Antman et al., 2002) [B] as described above for reteplase treatment.

Streptokinase Regimen

1. Rapid infusion of 200 to 300 mL of 0.9% NaCl if the patient is hypotensive. Give prophylactically, unless the patient has pulmonary oedema.
2. Streptokinase (Streptase®) 1.5 million U over 30 to 60 minutes as a continuous infusion. Initially without adjunct heparin; heparin may be introduced 6 to 12 hours later. If the patient has previously received streptokinase, tPA should be administered.

    - Streptokinase 1.5 million units dry substance is dissolved first into 5 mL 0.9% NaCl, or into another suitable diluent, and then further into 100 mL of 0.9% NaCl.

- Streptokinase infusion often causes hypotension. Should hypotension occur, elevate the patient's legs and discontinue any nitrate infusions. If hypotension persists, slow down or discontinue the streptokinase infusion. If necessary, infuse 0.9% NaCl or, in very severe hypotension, dopamine.
- Reperfusion, like acute infarction itself, is often accompanied by arrhythmias (ventricular ectopic beats, idioventricular rhythm). Isolated ventricular ectopic beats or short runs of ventricular tachyarrhythmias can be observed only. Lidocaine or electric cardioversion (30-100 J) is indicated in long-lasting ventricular tachyarrhythmias and when haemodynamic complications become apparent.

Transfer to Hospital

- If the patient's haemodynamic status is stable, he/she can be transported to a hospital during the administration of the thrombolytic therapy. A competent paramedic crew is sufficient if the patient's condition is stable; otherwise a doctor should accompany the patient.
- The patient should be monitored continuously and a defibrillator must be ready for use. Adrenaline (epinephrine), atropine, and lidocaine (for a bolus and infusion) must be readily available.
- A patient with an MI can be treated on a general ward, with adequate facilities, if invasive treatment is not an option

Prediction, Prevention, Monitoring, and Treatment Guidelines of Bleeding Complications

- Intracranial haemorrhage is a rare (1 to 2%) but the most serious complication of thrombolytic therapy. The risk increases if the contraindications are not observed. The incidence of intestinal and other haemorrhage is higher (5 to 10%) than that of intracranial haemorrhage, but they are treatable. Bleeding usually occurs 24 hours after the administration of the fibrinolytic agent.
- A bleed may be anticipated by monitoring the blood pressure, thrombocyte count, and haematocrit (e.g., every 6 hours during the first 24 hours after thrombolytic therapy). Vitamin K should be considered for patients who have previously received anticoagulants and are at risk of bleeding.
- Signs of an intracranial haemorrhage include impaired level of consciousness or symptoms affecting one side only. A bleed is confirmed with a computed tomography (CT) scan. Treatment may include the involvement of a neurosurgeon in order to evacuate the haematoma. Internal bleeding will cause a decrease in blood pressure and haematocrit.
- Treatment of bleeding complications consists of the administration of blood cells, fresh frozen plasma, and vitamin K.
    - Vitamin K corrects clotting factors with a delay of 6 to 12 hours.
    - Frozen plasma will normalize international normalized ration (INR) quickly.

        - Reversal of anticoagulation with frozen plasma requires large infusion volumes: reasonable only if there is a need for volume correction.
    - Protamine has only a weak effect on low-molecular weight heparin and is not much used.
    - Tranexamic acid will only prevent fibrinolysis, which usually has already taken place at this stage. Tranexamic acid is thrombogenic and often only harmful when used in connection with bleeding complications.
    - The effect of aspirin on platelets will persist for 3 to 5 days.

Assessment of Coronary Artery Patency

- Intravenous administration of a fibrinolytic agent opens an occluded vessel in 50 to 60% of cases. The outcome is dependent on timing related factors and the success rate might be as high as 80% if the time from onset of pain was <2 hours
- Chest pain improves.
- ST segments normalize rapidly.
- Reperfusion arrhythmias
- Early but short lasting rise in serum markers (8 to 12 hours).

Primary Percutaneous Transluminal Coronary Angioplasty (PTCA)

- Whenever possible primary angioplasty should always be considered instead of pharmacological reperfusion therapy (Grines et al., 2003; Keeley, Boura, & Grines, 2003) [A]; treatment outcome is better and the costs are lower (Keeley, Boura, & Grines, 2003).
    - Primary angioplasty has been shown in several studies to be more effective than pharmacological reperfusion therapy in the treatment of STEMI (Grines et al., 2003; Keeley, Boura, & Grines, 2003) [A]. Adequate flow rates are achieved in as many as 90% of cases.
    - The availability of angioplasty treatment and the provision of 24-hour cardiologist cover remain problems in many countries. Primary angioplasty is currently often only considered for high risk patients.
    - According to the Danish Multicentre Randomized Trial on Thrombolytic Therapy versus Acute Coronary Angioplasty in Acute Myocardial Infarction (DANAMI2) study, treatment outcome after angioplasty is superior to that achieved with thrombolysis provided that the angioplasty can be carried out within a 150 km radius. It is likely that the use of angioplasty, therefore, as a treatment for acute STEMI will increase as the facilities of treating centres improve.
- Angioplasty is a superior treatment form if the time interval between the onset of pain and treatment is long.
- Primary angioplasty may also be considered if pharmacological reperfusion therapy is for some reason contraindicated, or it has failed.
- According to the current guidelines, primary angioplasty may be considered for high risk patients with:
    - Extensive infarction + contraindication to thrombolysis
    - Extensive anterior infarction
    - Inferior infarction with significant right ventricular involvement
    - Acute pump failure

    - Cardiogenic shock
- If the patency of the artery was not achieved with pharmacological reperfusion therapy, a "rescue angioplasty" may be considered. The results of angioplasty carried out after pharmacological reperfusion therapy are not as good as those of primary angioplasty, but with modern equipment the procedure does, however, improve the patient's prognosis.
- Platelet glycoprotein IIb/IIIa receptor antagonists reduce the risk of death and myocardial infarctions as well as the need for urgent reintervention in association with percutaneous coronary angioplasty (Bosch & Marrugat, 2001; Vorchheimer, Badimon, & Fuster, 1999) [A].
- After implantation of a stent, the antithrombotic agent to be used is aspirin, which should be combined with clopidogrel for 3 to 6 months to prevent thrombosis and restenosis. With drug-eluting stents the combination therapy is continued up to 12 months. The epithelialization of drug-eluting stents is slow, and an uninterrupted aspirin-clopidogrel treatment is particularly important during the first few months after implantation (Iakovou et al., 2005)
    - Combination therapy increases the risk of bleeding in patients with a history of cerebral infarction.

Thrombolysis As First Aid

- The delay in treatment is shortened if the members of the emergency services start thrombolytic therapy. Motivated and trained personnel of an emergency service unit are able to interpret ECGs and make the diagnosis of an MI even better than an untrained doctor.
- Legal implications must be considered if a non-medical person initiates a potentially dangerous treatment. Therefore, the aim should be for a consulting physician to make the decision on initiating thrombolysis. Telemetry ECG makes such consultation possible.
- The hallmarks of the diagnosis are typical chest pain and ECG changes. Risk stratification should always be carefully carried out to avoid adverse treatment decisions. The current contraindications are not difficult to comply with.
- An international recommendation has been issued for the administration of pre-hospital thrombolysis, which should be adjusted to local conditions. The American Heart Association (AHA) recommendation is available on the Internet (www.americanheart.org). Tenecteplase (single bolus) is the easiest to administer, while streptokinase is the most difficult.

Related Evidence

- Low molecular weight heparins (LMWHs) and unfractionated heparin have similar efficacy in preventing death but LMWH caused fewer complications (Magee et al., 2003) [A].
- Coronary artery bypass grafting improves the physical functioning and prognosis in patients with moderate to severe left ventricular dysfunction and concomitant, performance limiting coronary heart disease (Baker et. al., 1994) [C].
- The medium and long-term outcomes after balloon angioplasty are favourable with a low mortality and myocardial infarction rate and a low rate of later restenosis (after 6 months) (de Feyter et al., 1994) [C].

- Angioplasty may lead to greater reduction in angina than is achieved with medical treatment, but the patient cohorts are too small as yet to allow for estimating the effect of angioplasty on the incidence of infarctions, deaths, or revascularisation (Bucher et al., 2000) [C].

Definitions:

Levels of Evidence

A. Strong research-based evidence. Multiple relevant, high-quality scientific studies with homogenic results.
B. Moderate research-based evidence. At least one relevant, high-quality study or multiple adequate studies.
C. Limited research-based evidence. At least one adequate scientific study.
D. No research-based evidence. Expert panel evaluation of other information.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Concise summaries of scientific evidence attached to the individual guidelines are the unique feature of the Evidence-Based Medicine Guidelines. The evidence summaries allow the clinician to judge how well-founded the treatment recommendations are. The type of supporting evidence is identified and graded for select recommendations (see the "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate and timely treatment of acute ST elevation myocardial infarction

POTENTIAL HARMS

- Streptokinase infusion often causes hypotension.
- Intracranial haemorrhage is a rare (1-2%) but the most serious complication of thrombolytic therapy. The risk increases if the contraindications are not observed. The incidence of intestinal and other haemorrhage is higher (5-10%) than that of intracranial haemorrhage, but they are treatable. Bleeding usually occurs 24 hours after the administration of the fibrinolytic agent.
- Combination therapy increases the risk of bleeding in patients with a history of cerebral infarction.

CONTRAINDICATIONS

CONTRAINDICATIONS

Contraindications to Thrombolytic Therapy

Absolute

- Strong suspicion of dissection of the aorta
- Pericardial effusion
- Active gastrointestinal or other internal bleeding
- Brain tumour, arteriovenous malformation, or aneurysm
- Ischaemic stroke in preceding 6 months (a verified transient ischemic attack [TIA] is an exception)
- Previous intracerebral haemorrhage or subarachnoid haemorrhage
- Intracranial procedure or recent head trauma
- Severe known bleeding disorder: coagulation abnormality, thrombocytopenia, etc.

Relative

- Fibrinolytic treatment should be considered even if the patient has relative contraindications if the onset of pain is within three hours, a large (anterior) infarction is imminent and no deep Q-waves have developed yet. The relative contraindications are:
    - Recent intestinal bleeding, for example an ulcer
    - Recent surgery or significant trauma within preceding 2 to 4 weeks
        - At least 4 weeks safety period after, e.g., brain or eye surgery
    - Hypertension (i.e., systolic over 180 to 200, diastolic over 100 to 110 mmHg)
    - Other life-threatening illness, for example hepatic cirrhosis, renal insufficiency, etc.
    - Anticoagulant therapy increases the risk of intracerebral haemorrhage. If the patient is at risk of bleeding, vitamin K should be administered.
    - Other factors increasing the risk of bleeding should also be taken into account (e.g., anaemia, thrombocytopenia, known haemophilia [also von Willebrand] advanced age, septic illness, cancer).

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2006 Apr 28 [various].

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2004 Sep 14 (revised 2006 Apr 28)

GUIDELINE DEVELOPER(S)

Finnish Medical Society Duodecim - Professional Association

SOURCE(S) OF FUNDING

Finnish Medical Society Duodecim

GUIDELINE COMMITTEE

Editorial Team of EBM Guidelines

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Primary Author: Editors

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Finnish Medical Society Duodecim. Thrombolytic therapy and balloon angioplasty in acute ST elevation myocardial

infarction (STEMI). In: EBM Guidelines. Evidence-Based Medicine [CD-ROM]. Helsinki, Finland: Duodecim Medical Publications Ltd.; 2005 Sep 25 [Various]

GUIDELINE AVAILABILITY

This guideline is included in a CD-ROM titled "EBM Guidelines. Evidence-Based Medicine" available from Duodecim Medical Publications, Ltd, PO Box 713, 00101 Helsinki, Finland; e-mail: info@ebm-guidelines.com; Web site: www.ebm-guidelines.com.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

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